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FILE

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	RM No. 8013
Rules to Adopt Permanent	)	
Regulations for Automatic Vehicle	)	
Monitoring Systems.	)	

OPPOSITION OF PINPOINT COMMUNICATIONS, INC.

PINPOINT COMMUNICATIONS, INC.

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SUMMARY

Pinpoint Communications, Inc. ("Pinpoint"), opposes the Petition for Rulemaking filed by North American Teletrac and Location Technologies, Inc. ("PacTel"). PacTel seeks changes to Section 90.239 and related rules governing automatic vehicle monitoring ("AVM") that would grant exclusivity to 8 MHz licenses for what PacTel termed "wideband pulse ranging" systems at 904-912 and 918-926 MHz, bands currently part of a Commission-fostered shared environment.

Before filing its Petition, PacTel obtained licenses in most of the largest 50 metropolitan areas in this country and was granted an extended implementation schedule, without benchmarks, of five years (as opposed to 8 months). American Information Technologies, Inc., an Ameritech affiliate, ("Ameritech") has done largely the same thing. PacTel now seeks a ten year implementation schedule, and wants to apply it retroactively to all of its, and presumably Ameritech's, licensed facilities. If PacTel's Petition were granted, PacTel and Ameritech, as a practical matter, would each have exclusive use of 8 MHz of spectrum nationwide.

The requested rules, therefore, would prevent multiple entry and largely foreclose pioneers such as Pinpoint and developers of other systems from deploying or continuing to deploy AVM technologies considerably more efficient and robust than that of PacTel. As a result, important objectives for private land mobile spectrum management mandated in Section 332(a) of the Communications Act -- efficient use of the band for promotion of the safety of life and property, the encouragement of

competition, the provision of service to the largest number of users, and the increased exploitation of sharing opportunities -- would be frustrated.

Moreover, Section 7 of the Communications Act requires PacTel, as the proponent of rules that would foreclose the development of new and existing competitive technologies, to justify the adoption of the proposed rules. This it has failed to do in several important respects.

As an initial matter, PacTel fails to substantiate its claim that the Commission should revoke its long-standing AVM spectrum sharing policies. PacTel glosses over the actual usage of the 902-928 MHz band, which includes various AVM applications and several other services. The public interest has been well served by multiple entry and the existing sharing arrangement among AVM systems mandated by the Commission when it established the AVM allocation in 1974. At that time, the Commission established forward-looking rules providing for liberal and flexible licensing policies, ideal for the development of new technologies and services in a mixed use band such as 902-928 MHz. The rules have succeeded in fostering the AVM marketplace. Furthermore, the Commission's AVM rules have proven entirely consistent with the spectrum management directives established by Congress in Section 332 of the Communications Act, including the requirement that the Commission consider increasing sharing opportunities among private land mobile services and other services.

PacTel effectively ignores the fact that AVM systems do not have priority use of the band. AVM is secondary to Industrial, Scientific and Medical ("ISM") uses and

government radiolocation. Amateur operations are licensed on a secondary basis to AVM, ISM and government radiolocation. Finally, numerous unlicensed uses are authorized under Part 15 of the Rules on a non-interference basis to all ISM and licensed operations. Accordingly, spectrum sharing and a flexible licensing policy has been and continues to be necessary in order to minimize the disruption both by AVM users to ISM and government radiolocation and by amateur and Part 15 users to AVM licensees. PacTel's argument fails to consider the higher priority uses while ignoring the FCC's reasons both for establishing a competitive and shared AVM environment and for permitting the amateur and Part 15 allocations in the band.

In addition, the adoption of exclusivity, as PacTel requests, would lock the AVM industry into inferior, spectrally inefficient technology. There is no doubt that hyperbolic multilateration (HML) is an AVM technology that would be in the public interest to promote. While Pinpoint has designed a robust HML system with the full expectation that it would operate in the existing shared environment, however, PacTel's Petition admits that the Teletrac HML system is hypersensitive. Appendix 2 to the PacTel Petition demonstrates that Teletrac is a very fragile system. A mere 10-watt interfering signal would disrupt service by nearly 71% in the greater Chicago area. In light of this and other admitted weaknesses, the Teletrac system will likely suffer destructive interference from ISM, and possibly government radiolocation and Part 15 emissions. PacTel's proposed relief, widespread deployment of the fragile Teletrac technology on an exclusive basis, would foreclose technical solutions more in the public interest.

Further, Pactel seeks a tremendous amount of spectrum, in fact, nearly three times more than will be allotted for new narrow-band personal communications services. Given that the Commission is currently considering a variety of communications systems that would employ spread spectrum techniques to increase capacity and minimize interference, PacTel's performance problems with this technology hardly provides a basis for a grant of exclusivity in such a large band.

In addition to the 8 MHz allocations, PacTel's seeks a separate "forward link" that is not part of its wideband HML channel. Before proceeding with any regulatory change that would authorize such a "forward link," the Commission should examine whether such a system makes efficient use of spectrum. Although Pinpoint agrees with the need for a forward channel, Pinpoint has solved this dilemma through technology that uses signalling in the same channel employed for vehicle location.

At bottom, PacTel's plan amounts to little more than a cover for its spectrum speculation. PacTel is now only offering service at a few locations, and has received an extended implementation schedule for all of its licenses. Rather than refining its AVM technology to survive within a shared band, however, PacTel has now petitioned for exclusivity, which retroactively would "cut-off" license applications for hundreds of cities. (Attached to Pinpoint's Opposition is a tabulation by state of the locked-up licenses of PacTel and Ameritech that, under PacTel's proposal, would reserve 8 MHz for only those entities in hundreds of locations.) It is apparent, therefore, that PacTel has taken advantage of FCC licensing flexibility within the 902-928 MHz band in an orchestrated effort to create a duopoly. Pinpoint submits that PacTel should not be

permitted to solve its system fragility problems with regulatory endowments as opposed to technical solutions.

Rather than adopt the regressive regulations proposed by PacTel, Pinpoint urges the Commission to consider refinements of the AVM rules that maintain a flexible band plan for licensing many different types of AVM systems with different spectrum needs. To this end, Pinpoint urges the FCC to open the entire 902-928 MHz band for AVM. This would facilitate the development of more robust HML technologies than PacTel's, such as Pinpoint's, that are also more compatible with non-HML systems, including various tag technologies. Pinpoint also urges clarification of the definition of AVM to allow the location of any moving, non-aeronautical-based item. Most importantly, the regulations should clarify that all AVM licensees are required to cooperate mutually in the shared use of the spectrum.

In short, the Commission should reaffirm a regulatory framework that will not cast in stone the inadequate technologies of the past. The Commission should continue to allow market driven technology to propel the development of systems that serve marketplace demand. Adoption of PacTel's proposal would have exactly the opposite effect, and its Petition should be denied.

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OPPOSITION OF PINPOINT COMMUNICATIONS, INC.

Pinpoint Communications Inc. ("Pinpoint"), by its attorneys, and in accordance with Section 1.405 of the Commission's Rules,[1] hereby comments on the Petition for Rulemaking filed by North American Teletrac and Location Technologies Inc. ("PacTel").[2] The Commission should reject PacTel's plea for exclusive 8 MHz assignments at 904-912 and 918-926 MHz for automatic vehicle monitoring ("AVM") systems, because exclusivity is not required for property designed AVM systems. Instead, the Commission should continue its policy of shared use of the 902-928 MHz band for AVM to facilitate the further development of a variety of AVM systems. In this way, the Commission can best meet its statutory obligations "to encourage the

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[1] 47 C.F.R. § 1.405 (1991).

[2] Shortly after the petition was filed, Pacific Telesis announced that it had obtained control of the joint venture. Communications Daily at 8 (May 29, 1992).

provision of new technologies and services to the public"[3] and "generally encourage the larger and more effective use of radio in the public interest."[4]

I. INTRODUCTION

On May 28, 1992, PacTel filed a petition seeking changes to Section 90.239 and related rule parts pertaining to AVM. PacTel urged the Commission to accord exclusivity to licensees operating what it termed "wideband pulse ranging" systems at 904 - 912 and 918 - 926 MHz. To implement the exclusivity, PacTel asked the Commission to mandate a 50-mile-radius protected service area for each such system coupled with a 110-mile co-channel separation requirement. PacTel also requested that each such exclusive license carry with it the right to employ an additional 250 kHz of spectrum at 925 or at 904 MHz for a so-called "forward link" channel for messaging in conjunction with the wideband channel. Finally, PacTel advocated expanding the definition of AVM to include locating persons and objects other than vehicles.

PacTel's proposal for exclusivity is contrary to the public interest. Before filing this Petition, PacTel and American Information Technologies, Inc. ("Ameritech"), through affiliated companies, obtained licenses for the two 8 MHz bands in most of the largest 50 metropolitan areas with implementation schedules extended beyond the FCC's normal 8-month construction period in order to protect these licenses -- largely

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[3] 47 U.S.C. § 157(a) (1988).

[4] 47 U.S.C. § 303(g) (1988).

unconstructed -- for five years. (PacTel's proposed rules would further extend implementation for up to ten years.) As a result, PacTel would have exclusive use of one 8 MHz band nationwide for a relatively inefficient and technically fragile AVM system; the second 8 MHz band would likely be Ameritech's. These rules would largely foreclose pioneers, such as Pinpoint and others, from developing and deploying considerably more efficient and robust technology that, unlike PacTel's, is designed for the Commission's current 902-928 MHz shared environment.

II. IDENTITY AND INTEREST

A. Pinpoint Has Developed Robust, High Capacity AVM Technology

Pinpoint is a Texas corporation headquartered in Dallas. Pinpoint has invested millions of dollars in the development of ARRAY™, a unique AVM system that will locate vehicles and provide two-way data communications related to the vehicle. ARRAY™ has been designed to be high capacity and to be sufficiently robust to operate in a band that will be shared with other AVM systems of differing types including tag systems, government radiolocation systems, ISM equipment,and a large number of Part 15 radio frequency devices. This effort has been conducted in reliance upon the current AVM rules of the Commission, which provide for shared use of the 904 - 912 and 918 - 926 MHz portions of the 902-928 MHz band.

ARRAY™ will provide a platform for many AVM services in addition to vehicle position location. These include computer assisted dispatch for businesses and public safety agencies, automobile road service assistance, computer assisted navigation along streets and highways and information services designed to let a driver know of the nearest location of various types of businesses. While stolen vehicle recovery may also be carried out, Pinpoint does not see that market as the prime rationale for a spectrum allocation nor as the application that will utilize AVM to achieve more efficient management of mobile resources.

Pinpoint's plans complement national transportation policies. ARRAY™ will help to bring to reality advanced traffic management systems, enhanced traveler information systems, commercial vehicle operations, and advanced public transportation systems. These are all objectives of the Intelligent Vehicle-Highway Systems Act of 1991, which is intended generally to promote the research, development, and operational testing of intelligent vehicle-highway systems ("IVHS") and the implementation of such systems as a component of United States transportation policy.

The AVM capabilities of ARRAY™ will enable, for example, persons with dashboard mounted display terminals in their vehicles to request automatic routing information in unfamiliar neighborhoods and receive information on current traffic conditions. Simultaneously with the radiolocation function, the operator of the vehicle will be able to send and receive location-related messages. Thus, in emergencies, a driver could summon help from police, paramedics, or a towing service, without

having to leave the vehicle, solicit the aid of strangers or determine the vehicle's exact location. With its positioning capabilities and automatic distress signal functions, ARRAY™ will also offer invaluable assistance to police departments tracking stolen vehicles and fire rescue departments rushing to the scene of an automobile accident or medical emergency. These features, in combination with high-speed data communications, will not only benefit consumers who have subscribed to value-added vehicle locating services, but provide major efficiency gains for commercial fleet managers.

Pinpoint concurs with PacTel's assessment of the important public interest in AVM systems and the need to foster such systems in the 902-928 MHz band. Unlike PacTel, however, Pinpoint will be able to offer these services operating in shared spectrum. Indeed, Pinpoint's technology is testimony that the radical solution PacTel requests -- spectrum exclusivity -- is not the way to advance the broad development of AVM.

Pinpoint's ARRAY™ system uses one of the many forms of direct sequence spread spectrum technology in the 902-928 MHz band. Pinpoint's system uses relatively long-range (e.g., up to 10 miles) hyperbolic multilateration (HML).[5] ARRAY™ will permit the positioning of vehicles to an accuracy of 15 meters in urban

[5] HML systems compute position from the time difference-of-arrival at a minimum of two pairs of base stations. From each of the time-differences, a hyperbolic line-of-position can be implied in two dimensions (or a hyperbolic surface in three dimensions). Computing the intersection of these lines of position provides a fix (an estimate of position) relative to the known position of the base stations from which the measurements were made.

centers and 6 meters in suburban areas. The ARRAY™ system will accommodate 3.24 million position fixes each hour in a local locating "cluster"[6] in as little as 8 MHz of spectrum while, at the same time, allowing related messages to be communicated at 94.25 kbps, using relatively inexpensive mobile units. As discussed, infra, by expanding the bandwidth by a factor of two to 16 MHz, data rates and the number of position fixed each hour can be increased by at least a factor of four, without increasing the cost of mobile units. Such an increase in bandwidth also increases robustness by facilitating faster repeats in the case of a lost signal and improves immunity to interference by a factor of two.

During the summer of 1991, Pinpoint conducted propagation studies in several major cities to characterize the noise conditions likely to be encountered in the 902-928 MHz band. Much of this work was specifically designed to enable Pinpoint to ensure that ARRAY™ could operate effectively in a shared use environment. Following these studies, Pinpoint has completed additional work on the design of the system and has sought patent protection.

Unless impeded by regulatory delays, Pinpoint expects to begin field testing late this year. The PacTel petition, however, if granted would foreclose the opportunity for further development of the Pinpoint system in the band most suitable for AVM systems.

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[6] A "cluster" is at least two pairs of base stations near the mobile that receive its transmission. In a metro area, multiple clusters may operate independently. In Los Angeles, for example, there may be more than 15 simultaneously operating clusters resulting in an aggregate network throughput of 15 x 3.24M = 48.6 million position fixes per hour.

B. Hyperbolic Multilateration Systems Offer Unique Capabilities Not Otherwise Available in the AVM Market

In the eighteen years since the Commission adopted "interim" rules governing AVM,[7] the marketplace has yielded a wide variety of technologies that address a host of vehicle monitoring needs. Some of these, such as Global Positioning Service (GPS), Loran C, and dead reckoning, do not depend upon spectrum in the 902-928 MHz band. Others, including HML systems such as those of PacTel and Pinpoint and various tag systems employing modulated backscatter, have their home in the 900 MHz AVM allocation.

Pinpoint submits that the public interest is best served by the availability of many different types of AVM systems. For example, the cost of GPS receivers is declining and such technology can offer extremely good accuracy (e.g., within thirty meters) in certain commercial applications. However, GPS does not offer a comprehensive solution to the problem of determining the location of moving vehicles in the concrete canyons of America's cities because an unobstructed view of a sufficient number of GPS satellites is often unavailable when large portions of the sky are blocked by tall buildings. Dead reckoning systems depend on the ability of the system to start from a known position and calculate speed and direction of travel with great precision. Without frequent updates against a reference point, large errors result.

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[7] Automotive Vehicle Locator Systems, 39 Fed. Reg. 28,881 (1974)

Loran C Technology was originally developed for coastal navigation and has been increasingly applied to terrestrial and aeronautical applications. With typical accuracy of between 50 and 1000 meters, Loran C also fails to offer a comprehensive solution for tracking the location of moving vehicles in urban environments. Because of interference from power line carriers and atmospheric noise, Loran C Systems (which operate at 100 kHz) are, at best, a poor alternative to highly accurate pulsed HML. Moreover, Loran C, like GPS and dead reckoning, do not permit the exchange of data related to the object's location within the ranging bandwidth.

Pulsed HML systems thus offer a unique and highly valuable solution to the problem of determining the location of vehicles.[8] Like PacTel's system, Pinpoint's ARRAY™ will be able to locate vehicles and other objects. Unlike PacTel's Teletrac, however, ARRAY™ is specifically being designed to incorporate the related data in the signals employed for location determination.[9]

As the Commission's records show, PacTel has obtained licenses in the major markets of the United States. According to PacTel, it has actually built systems only in Los Angeles, Detroit, Chicago, Dallas, and Miami. The Commission's licensing database also indicates that METS, Inc., a subsidiary of Ameritech, holds licenses in major markets across the United States and has applied in many more for an essentially equivalent system. Thus far, it appears that no METS facilities are on the air. The

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[8] Loran C is also an HML system. However, as used in this Opposition, the "HML" refers to pulsed systems such as those of PacTel and Pinpoint.

[9] See infra for a discussion of PacTel's forward links.

PacTel system, and the METS system as well, benefit from extended implementation schedules giving them five years to construct their systems.[10]

If existing licensees of HML systems in the 904-912 and 918-926 MHz portions of the 902-928 MHz band are grandfathered into a position of exclusivity, regardless of whether they have built and operated systems, Pinpoint's ARRAY™ will be barred from an opportunity to compete in the AVM marketplace for HML systems. While there may be practical limits to the number of HML systems that reasonably can be accommodated within the 902-928 MHz band, the number definitely exceeds two proposed by PacTel.[11] As detailed below, grant of the PacTel petition would effectively stifle competition in the development and operation of HML systems, reserving the field only for PacTel and Ameritech.

III. ARGUMENT

In its Petition, PacTel asserts that because the Teletrac system is so fragile the Commission should revoke its AVM spectrum sharing policies as the only way to encourage continued development of the AVM marketplace.[12] However, PacTel's

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[10] Letter from Terry Fishel, Chief, Land Mobile Branch, to Carole Harris, Counsel for Teletrac (Mar. 23, 1989); Application of METS, Inc. FCC File No. 338844 (filed Jan. 24, 1992).

[11] Pinpoint recognizes that various reader/tag systems may offer valuable contribution to the AVM marketplace. In contrast to HML technology, however, tag systems typically serve short-range AVM applications. Such systems are of great importance in, for example, automatic toll collection, the identification and location of railroad rolling stock, the tracking of intermodal containers, and the automation of manufacturing facilities. Pinpoint has long envisioned that it would share spectrum with such systems and has designed its system accordingly.

[12] PacTel Petition at 26-32.

engineering proves too much: Other users will share the band whether or not additional AVM systems are licensed, and PacTel's delicate system is not likely to work in the face of this interference. PacTel's fragility is a poor reason to foreclose forever the competitive development of new AVM technologies. Moreover, Pinpoint's development of a wideband AVM technology that can operate consistently with the existing sharing and multiple entry policies refutes PacTel's claims. Given the FCC's obligation in Section 7 of the Communications Act to promote new technologies and services,[13] PacTel has failed to show, as that section requires, that the public interest supports its plan.

A. The AVM Band Is, and Will Continue To Be, Shared Among Multiple Services

PacTel glosses lightly over the actual uses of the 902-928 MHz band. Careful examination indicates that the AVM spectrum is shared among various AVM users and with several other services. Moreover, the public interest has been well-served by the existing sharing between AVM systems. Accordingly, Pinpoint submits that the 902-928 MHz band should continue to be available for a variety of AVM technologies, users and services on a shared basis.

AVM systems do not even have priority use of the band. This band is an Industrial Scientific and Medical (ISM) band on a primary basis for non-

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[13] 47 U.S.C. § 157(a).

communications uses. While consumer ISM applications have not gravitated to this band, it is employed for certain medical and industrial purposes. Commercial ISM equipment is not limited as to the amount of energy that may be radiated within the band or its location.[14] Thus, at any given time and at unpredicted locations, users of this band may experience strong signals from ISM users.

Government radiolocation occupies the next order of priority. Pinpoint understands that the most likely government systems operating in this band are off-shore radar, but other, terrestrial operations remain possibilities at various field strengths. The PacTel petition would not change either of these priorities.

Non-government AVM operations occupy the third level of priority in the band.[15] Amateur operations are the fourth priority.[16] Numerous unlicensed uses authorized under Part 15 of the Rules -- including, increasingly, cordless telephones -- operate on a secondary non-interference basis to all ISM and licensed operations.[17] Such equipment, of course, also may be operated at any location.

In part for these reasons, the Commission mandated sharing among various systems when it established the AVM allocation in 1974.[18] The agency recognized

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[14] 47 C.F.R. § 18.305(a) (1991).

[15] 47 C.F.R. § 90.239 (1991).

[16] 47 C.F.R. § 97.301(a) (1991).

[17] See 47 C.F.R. §§ 15.243-.249 (1991). See also 47 C.F.R. § 15.5 (1991) (specifying non-interference conditions).

[18] Cf. 47 C.F.R. § 90.173(a) (1991) (requiring spectrum sharing unless otherwise specifically provided).

that it could not at that time predict the direction of AVM technology or the AVM marketplace.[19] Thus, it provided liberal and flexible licensing policies, which are ideal for developing new technologies and services in a mixed use band such as 902-928 MHz. The Commission's regulations have led to the development of many forms of AVM, including Teletrac and ARRAY™. At the same time, the FCC's policies have overseen the growth of ISM equipment, permitted the evolution of various amateur modes, and allowed development of a wide variety of Part 15 systems including various RF identification technologies, wireless spread spectrum local area networks, security systems designed to prevent theft, a new generation of cordless telephones, and audio-visual distribution systems.

In so doing, the FCC's forward-looking rules are consistent with more recent developments. Specifically, in managing spectrum in the private radio services under its statutory obligation,

> the Commission shall consider, consistent with section [1] of this [Act], whether such actions will
>
> > (1) promote the safety of life and property;
> >
> > (2) improve the efficiency of spectrum use and reduce the regulatory burden upon spectrum users, based upon sound engineering principles, user operational requirements, and marketplace demands;
> >
> > (3) encourage competition and provide services to the largest feasible number of users; or

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[19] Automotive Vehicle Locator Systems, 39 Fed. Reg. at 28,881, 28,883.

> (4) increase interservice sharing opportunities between private land mobile services and other services.[20]

Moreover, ample FCC precedent in the 20 years since AVM rules were adopted recognizes the value of spectrum sharing and competition.[21]

If AVM users of the band that are secondary to ISM and government radiolocation are to avoid interference from such higher priority uses, a flexible licensing policy is necessary in order to minimize the disruption to uses that, while junior in order of priority, nevertheless serve important functions. PacTel would have the band carved into exclusive suballocations for it and one other HML system. Not only does PacTel's argument fail to consider these other, higher, priority uses,[22] it ignores the FCC's reasons for establishing a competitive and shared AVM environment in the first instance.

Although Pinpoint recognizes that exclusivity may hold some merit when the Commission has the luxury of allocating virgin spectrum, the 902-928 MHz band is inherently a shared band already occupied by a plethora of useful services. Efficient use of the band for the promotion the safety of life and property, the encouragement of competition, the provision of services to the largest number of users, and increasing

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[20] 47 U.S.C. § 332(a) (1988).

[21] Indeed, the FCC will now reward innovators that develop "proposals that promise to enable the sharing, or co-use, of allocated spectrum" with licenses. Establishment of a Pioneer's Preference, 6 F.C.C. Rcd 3488, 3492 (1991).

[22] PacTel provides no analysis of the compatibility of its system with ISM or government radiolocation.

sharing opportunities will not be facilitated by freezing the number of HML licensees in the 904-912 and 918-926 MHz bands at a total of two in almost every market. To the contrary, sound management of the band and pro-competitive policies can meet the objectives of Section 332 of the Act as well as those of Sections 1, 7, and 303 while assisting society to address the goals of IVHS and to manage mobile resources more efficiently in numerous applications.

B. PacTel's Flawed System Design Should Not Be Rewarded with Spectrum Exclusivity

PacTel argues that exclusivity is necessary in order to attract investment that would allow it to expand its operations. In contrast, the Commission has often expressed the view that flexibility and freedom to respond to marketplace demands are necessary to allow technology to develop.[23] Pinpoint believes that the design of AVM systems has yet to reach its full potential. In fact, adopting exclusivity at this time -- fashioned, as PacTel suggests, around its Teletrac system -- will lock the industry into inferior, spectrally inefficient technology.

1. PacTel's System Is Spectrally Inefficient

Pinpoint designed its system with the full expectation that it would operate in a shared environment in the presence of a variety of other emitters and thus was required

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[23] See, e.g., Cellular Flexibility, 3 F.C.C. Rcd 7033 (1988). As discussed above, a variety of services can continue to grow and flourish in a shared band environment such as that 902-928 MHz now presents.

to be relatively robust. The analysis submitted with PacTel's petition, however, attests to the Teletrac system's intolerance of interference. Indeed, PacTel's argument for changes in Section 90.239 could best be summarized as "fragility should lead to exclusivity."

In support of its petition, PacTel attaches as Appendix 2 a document entitled "Impact of Co-Channel Interference on 900 MHz Wideband Pulse-Ranging AVM System Performance." Accepting the analysis on its face, PacTel proves that Teletrac is a very fragile system.

The discussion contained in Appendix 2 to PacTel's Petition aptly illustrates the syllogism that is the essence of its plea to the Commission:

> (1) AVM can provide useful services in the public interest through locating vehicles;
>
> (2) the Teletrac system is fragile in that even low-powered signals in the same band impair its accuracy and capacity significantly;
>
> (3) Teletrac has considered ways in which to improve its performance to enhance its ability to reject interference but the following methods will not work:
>
> - adding more receive sites - too costly;[24]

[24] Appendix 2 at 18. The Appendix 2 discussion goes on to note that the computer modeling described in it as the basis for the interference claims does not account for multi-path, which PacTel says it tries to overcome with additional sites. Id. at 20. Under at least some circumstances, therefore, PacTel has concluded that additional sites are an appropriate solution.

- increasing mobile power - too costly; could hurt the development of portables and might interfere with others;[25]

- increasing pulse length - this would decrease capacity: a 10 dB increase in robustness through longer pulses would cut capacity by a factor of 100;[26]

- using directional antennas - must rely on omni-directional antennas to receive the desired signal.[27]

(4) accordingly, because Teletrac's offering serves the public interest but is so fragile, the only way to protect it from interference is to accord it exclusivity in the band.

Indeed, one passage from its technical presentation captures the essence of PacTel's position:

> "In the United States two thirds of the automobile alarms sell for less than $500. A highly complex vehicle location unit, engineered to overcome co-channel interference problems, would be far more expensive. Its price would be beyond the willingness or ability of many consumers to pay. Similarly, a redesigned fixed network, with more fixed sites, would result in a much higher monthly service charge, and this also would make the service unaffordable to many consumers. It is then of primary importance to all AVM systems operators that co-channel separation requirements be implemented to preserve service

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[25] Appendix 2 at 18-19. PacTel's Petition asserts that its units operate with 5 watts of output power and substantially lower ERP because of antenna inefficiencies brought on by efforts to hide the antenna. In contrast, its license applications specify mobiles with an ERP of 158 watts with a 50 watt output power. While this would be a relatively high power mobile, the mobile transmits for only a fraction of a second at a time in most modes. Thus, the PacTel licenses portray what Pinpoint had previously believed to be a far more robust system.

[26] Appendix 2 at 19.

[27] Appendix 2 at 20.

> quality and thereby allow AVM system operators to deliver maximum value to the public at an affordable price for the consumer."[28]

Summarized more succinctly, PacTel's Petition simply requests that the FCC sanction -- at the expense of the public interest -- an inefficient technology that PacTel is unwilling to fix, at least until after accorded exclusivity.

In order to drive home the fragility of its system and the alleged need to achieve an extraordinarily quiet RF environment over a relatively large area, PacTel poses a hypothetical interferer to its Chicago system.[29] In this modeling, PacTel assumed a 10 watt interfering signal (apparently at an elevation of six feet) located at the intersection of I-55 and I-295 (a location about 15 miles south of O'Hare International Airport). According to PacTel, the 10 watt signal would cause service to drop from 2,332 square miles in the greater Chicago area to 672 square miles.[30] Thus, a mere 10 watt interfering signal would cause service to drop by nearly 71 percent.[31]

Given its admitted weaknesses, the PacTel system will likely suffer destructive interference from ISM, and possibly government radiolocation and Part 15 emissions. Thus, widespread deployment of PacTel's fragile technology on an exclusive basis

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[28] Pactel Petition, Appendix 2 at 5.

[29] PacTel notes that the computer modeling does not account for the worst-case negative gain that is inherent with its use of mobile hidden antennas nor does the modeling account for ambient noise, id., at 21, points that make its interference analysis all the more difficult to assess.

[30] Pactel Petition, Appendix 2 at 30.

[31] It appears that the interfering signal posited by Pactel is a wide-band continuous signal spreading over the 904-912 MHz band.

would not only impede competitive AVM technologies such as Pinpoint's, but could frustrate the Commission's goal of encouraging the development of relatively high-powered spread spectrum Part 15 devices in this band as well as a host of other non-spread spectrum Part 15 devices.[32] In this regard, it is significant that PacTel's interference exhibit does not analyze interference from either ISM equipment[33] or Part 15 devices.[34] Before the Commission considers any exclusivity for PacTel, it should thoroughly analyze the operation of the system to determine whether the technology comports with maintaining a reasonable level of electromagnetic compatibility within the 902-928 MHz band.

Indeed, although PacTel acknowledges that it competes with other technologies such as Lo-Jack for the location of stolen vehicles,[35] the Lo-Jack system uses only 20

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[32] Pinpoint recognizes that Part 15 equipment operates at the sufferance of licensed services. The premise undergirding the standards developed for Part 15 equipment is that the emission limits allowed for Part 15 devices are sufficiently low that it is unlikely such equipment will cause interference. Nevertheless, Part 15 equipment is not authorized with respect to its location of use nor are the numbers of Part 15 devices allowed in a given area regulated.

[33] PacTel offers no explanation as to how it would overcome the radio noise produced by an ISM operation in the band, a use to which PacTel will remain secondary. Yet, a plant employing a commercial heater operating within this band would significantly raise the noise level far more than the 10 watt hypothetical facility assumed by PacTel in its petition.

[34] The Part 15 issue associated with 902-928 MHz is particularly significant because this band is employed for a variety of Part 15 equipment used in commercial applications. These include both spread spectrum and non-spread spectrum local area networks designed to connect computers, a new generation of cordless telephones, a wide variety of relatively high-powered field disturbance sensors widely used in commercial locations to deter shoplifting, and various audio/video distribution systems, all of whose production is likely to increase. All of these contribute to the ambient noise levels in the band but were not examined by PacTel.

[35] See PacTel Petition at 5 n.8.